1983

ANNUAL SUMMARY

COOPERATIVE FOREST PEST ACTION PROGRAM

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PLANT PEST CONTROL DIVISION
COOPERATIVE FOREST PEST ACTION PROGRAM

1983 ANNUAL SUMMARY

GENERAL COMMENTS

The year 1983 was one that we may never forget. If we do forget 1983, there were climatic conditions that will influence our forests for years to come. The winter of 1983 was mild, then came freezing weather in late May that harmed many crops and an abundance of rain late in May-June prevented many crops from being planted. If that wasn't enough, after the crops were planted a drought with high temperatures occurred that ruined many crops and affected our forests to an unknown extent. Hillsides and ridges in the Eastern Panhandle were completely brown in mid-August. We can only wait until 1984 to see the effects of the drought. The months of October-November were normal and forest fires were at a minimum. However, the month of December left us with vivid memories of below zero temperatures. Let's hope that 1984 will be normal.

In 1983 the looper complex in the Eastern Panhandle collapsed, but the gypsy moth populations are building.

A mortality study was completed on the forests affected by the looper complex which showed that we lost 20% of our oaks due to successive years of defoliation.

A treatment program to suppress gypsy moth took place on 16,735 acres in Morgan and Berkeley Counties.

Gypsy moth egg mass surveys indicate that approximately 50,000 acres of forest land need treated in 1984.

Aerial flights were conducted over a 12-county area to spot and delimit oak wilt disease. Oak wilt was found in Harrison County. The same area will be flown in 1984.

The tuliptree scale was a major problem throughout the state and many trees had dead or dying branches. If scale persists, many tulip trees (yellow poplar) may die as a result of the scale insect feeding.

Populations of cankerworms are increasing in the Middle Mountain area of Randolph County.

Caterpillars of the gypsy moth were found for the first time at Dam Site 14 in Grant County. Caterpillars were also found in Garrett County, Maryland near the Preston County line.

FOREST INSECTS

Each year we look for native insects that may cause damage to the forests of West Virginia. In 1983 the major native defoliators were present, but generally no outbreaks are expected in 1984. (Gypsy moth excluded).

The eastern tent caterpillar, Malacosoma americana, only a nuisance caterpillar in some instances but a defoliator of untreated fruit trees and wild black cherry, is at an all time low in central and southern West Virginia. The populations in the Eastern Panhandle are expected to collapse in 1984. Several caterpillar specimens were collected from the Eastern Panhandle and the polyhedrosus virus was evident. The polyhedrosus virus can be found naturally in populations and after several years it is a major factor in the decline of the insect. A tachinid fly is also an important natural insect that causes populations to collapse. The flies in the year after a population collapse are often a nuisance to humans, however these flies are harmless to man.

The forest tent caterpillar, Malacosoma disstria, was found in several areas of the state but in no instance were the populations in large enough numbers to cause damage to our forests or to be of concern.

Populations of the fall webworm, Hyphantria cunea, were extremely high in Brooks and Hancock Counties during late summer. Numerous nests were also observed in southern and southeastern counties of West Virginia. This insect is very difficult to predict and it may be extremely abundant in 1984. We do not attempt control because the insect normally defoliates the trees in late summer when the growth of the tree has ceased and normal leaf fall is about to occur. The nests in the trees are unsightly and seem to cling to the trees until new leaves in the spring hide the remains of the old nests.

Fall cankerworm, Alsophila pometaria. Populations of this insect are building in the Harman-Middle Mountain area of Randolph County, but not as rapidly as originally thought. Perhaps in the high elevations (colder winters and late spring) the insects are being delayed and will not develop to any great extent. Surveys will be conducted to determine the amount and extent of damage expected. We have had occurrences of this insect in various parts of the state and defoliation has occurred.

The walking stick, Diapheromera femorata, has been a major defoliator of hardwoods in the Eastern Panhandle in past years. However, the insect seems to have subsided and few specimens have been collected or seen.

White pine bark aphid, Pineus strobi, populations have been increasing and if one expects to have healthy trees they must plan some type of control. Christmas trees inspected in the Ohio Valley area have a distinct off-color, yellowish appearance and the boles of the trees have a whitish appearance. A yellow or off-color white pine is difficult to market at Christmas time and a planned control program may reap a larger monetary return. Several white pine trees at North Bend State Park have dead and dying tops which are the result of the insect feeding.

Pine spittle bud, Aphophora parallela, is an insect that in the past has been given little attention by Christmas tree growers. Recent research

has shown that this insect is capable of causing death to pines after 2 to 3 successive years of infestation. In the past we had noticed the decline of Christmas tree plantations and were at a loss to explain the cause. However, in most instances the spittle bugs were prevalent and little attention was given to control. A publication on spittle bug is available for distribution. If you request this publication we will furnish it as long as supplies last.

Oak leaf tier, Croesia albicomana, egg mass surveys were conducted in January-March 1983 to check for occurrence of, and to delimit the areas of, expected infestation. Very few eggs were found in 1983 and the insect caused little damage in 1983. Generally the insect is still confined to Pocahontas and northern Greenbrier Counties.

Locust leaf miner, Xenochalepus dorsalis, is increasing in the higher elevations of Pendleton, Pocahontas, Randolph and Webster Counties. Also it is increasing in the Eastern Panhandle and Greenbrier Valley area. The insect has subsided somewhat in the western and southern areas of West Virginia. Each year we hear the statement that the locust trees have a blight. This is not true, and we would like for you to pass along the following information: the locust trees are experiencing an attack by an insect called the locust leaf miner. This insect (adult beetle) lays eggs which turn into small larvae that feed or mine between the upper and lower surface of the leaf. This feeding removes the chlorophyll and the leaf turns brown. The locust trees leaf out next year and appear healthy until about the first of August when the damage again is noticeable.

Tulip tree scale, Toumeyella liriodendri, was extremely abundant this year and occurred throughout the state on yellow poplar (Tulip tree). Many trees had dead branches and some trees appeared on the verge of dying. The populations were at an all time high this year and may persist into 1984. The scale insect secretes a clear sweet substance called honeydew, which is an excellent medium or substrate on which fungus will grow upon. The fungus that grows on the honeydew is called sooty mold and it has a black appearance. If leaves or branches of your yellow poplar have a black appearance, it probably has an infestation of scale insects.

It was noted in early fall that certain lady beetle larvae were feeding on the scale insects and control recommendations were in many instances not encouraged. We will have to wait until late summer 1984 to see if nature (lady beetle) is succeeding in controlling the scale.

Cherry Scallop Shell Moth, Calocalpe undulata, is a looper (inchworm) that attacks wild cherry by fastening together the terminal leaves and making a nest. The larvae then feed on the upper epidermis of the leaves in the nest. The leaves turn brown and give the tree an unsightly appearance. Normally the scallop-shell moth does not pose a serious threat to wild cherry. However, heavy populations can cause reduced growth and stress in the trees which may result in death. The scallop shell moth is increasing in the Pocahontas, Randolph and Webster County area. Watch for this insect in 1984.

Cottony Maple Scale and Cottony Maple Leaf Scale, Pulvinaria innumerabilis and Pulvinaria acericola, were very common this year and caused some problems with yard trees. The cottony maple scales are readily identified

by the white flocculent material that is secreted and carried by the scale insect. Trees with heavy infestations will have limbs or leaves that will appear as if small cotton balls have been placed over the entire surface.

The cottony maple scale is normally found on the branches and the cottony maple leaf scale will be on the leaves. However, the leaf scale migrates to branches and twigs in the fall. One of the major problems with scale insects is the honeydew that is secreted and falls upon vehicles, houses or other plants that are under infested trees. To get rid of the honeydew on plants, houses, vehicles, sidewalks, etc., wash with warm soapy water.

Oak leaf skeletonizer, Bucculatrix sp., skeletonizes the leaves of red, black and white oaks. The skeletonizer has two generations per year (June - early July and late August - October) and the second generation was very prevalent this year and damage was noted. Control efforts are not necessary since the insect occurs in late fall.

LOOPER COMPLEX

The looper complex, which is made up of Geometrids (commonly called measuring or inch worms) caused complete defoliation to approximately 35,000 acres of hardwoods in June of 1983. To date the looper has caused more defoliation and damage to our forests than any other insect that West Virginia has experienced in modern times.

In 1983 the acres defoliated were in Mineral, Hampshire, Berkeley and Morgan Counties. We had predicted that heavy defoliation would take place over one million acres of forest land in 1983. Our egg mass surveys and adult surveys indicated the insects were present and that defoliation could take place. The insects did hatch and start their normal feeding habits, however, the native predators, parasites were abundant and the looper population collapsed.

The looper complex in 1981 completely defoliated one million acres in the Eastern Panhandle and a half-million acres in southwestern West Virginia. In 1982 the looper complex caused 100,000 acres of forest land to be defoliated in the Eastern Panhandle. None were noted in southwestern West Virginia. In 1983 the defoliation was a modest 35,000 acres. In all the years of defoliation the looper complex did not cause defoliation on the high mountain ridges, but stayed on the slopes, valleys and ridges between the higher mountain ranges. The major defoliation for 1981-82 occurred in Grant, Hampshire, Mineral, Morgan, Hardy and Berkeley Counties.

In 1982 we were receiving reports of dead and dying hickories and oak in the Eastern Panhandle. We stated that surveys would be conducted to see if mortality had taken place in the looper complex areas. Plots were established in 1983 and the following is the result.

LOOPER MORTALITY

In 1983 aerial surveys were conducted by WVDA to detect and map defoliation. It was noted that many areas had experienced heavy mortality. These areas were reported to the West Virginia Department of Natural Resources Forestry Division and, with the assistance of the WVDA personnel, mortality studies were conducted. The areas selected for study were Cacapon Mountain, Sleepy Creek Mountain, Short Mountain, Spring Gap Mountain, and Sideling Hill Mountain.

Some of the major highlights were: the oaks comprised 71% of the forest areas sampled. After two years of successive defoliation 21% of all tree species were dead or dying. Twenty percent (20%) of the oaks experienced mortality. The most affected area was Cacapon Mountain where 28% of oak sawtimber stands and 17% of oak pulpwood stands were dead.

The overall figure (average) for mortality on all sawtimber areas surveyed was 21% of all species and 20% for oaks. The overall mortality figure for pulpwood was 13% for all species and 17% for oaks. The only area having actual pulpwood stands was Cacapon Mountain.

Small patches of one-half to three acres were observed in the cruise where mortality ranged from 80-90%. At all locations mortality was not restricted to intermediate or suppressed trees. Dominant and codominant oak and hickory trees with large crowns and good form were killed. Very few of the dead trees developed sprouts and the hardwood reproduction in the understory was scarce and heavily browsed by deer.

The next logical question would be what is the value of the timber that was lost? A conservative stumpage figure of $65.00 per thousand board feet for sawtimber and $3.00 per cord for pulpwood was used to figure the per acre value of live and dead timber for each area cruised. The value attributed to these trees represents the estimated timber value at time of death and should not be considered as the salvage value. The total estimated damage resulting from the looper defoliation in the 2,360 acres surveyed was $181,684.00. This included 2,605,637 board feet of sawtimber valued at $169,366.00 and 4,106 cords of pulpwood valued at $12,318.00.

When computed on a per acre basis, the average loss of sawtimber was $102.92/per acre and pulpwood $14.85 per acre.

This report is available from the WVDA. If you desire a copy, please request by calling 304/348-2212 or writing Alan Miller, West Virginia Department of Agriculture, Capitol Building, Charleston, West Virginia 25305.

GYPSY MOTH

Gypsy moth, Lymantria dispar, continues to move relentlessly southward and westward. In 1983 the gypsy moth defoliated 2,383,368 acres in the northeast. This is a decrease of 5,787,833 acres from 1982. Increased suppression projects, parasites, predators, adverse weather during May-June and natural collapse contributed to the decrease. The States of Maryland, Delaware, and Michigan had increases in defoliation.

West Virginia has not experienced defoliation by the gypsy moth and this was probably due in part to the 1983 suppression on 16,735 acres of heavily infested forest land.

The first large treatment for gypsy moth took place in Berkeley and Morgan Counties during May 17-19, 1983. Approximately 16,735 acres were treated with Thuricide 32LV (Bacillus thuringiensis). The results of the treatment are outlined in a publication by Tom Mason, West Virginia Department of Agriculture. The treatment gave foliage protection but reduction of gypsy moth populations was only 43.4% overall. The population reduction was not what we had expected to achieve (70-80%). However, the West Virginia suppression program was no different than in other states that used Bt in 1983. It is believed the cold weather in May delayed the development of the gypsy moth larvae (even though 2nd and 3rd instars were prevalent at time of treatment) and a larger segment of the populations was present after the Bt had lost its effectiveness. In order for each to see what takes place in a treatment project, the following is offered.

The treatment of gypsy moth began on May 14 with the calibrating of aircraft to determine the flow of chemical per minute and swath width.

The days of May 15 and 16 were rainy and time was spent familiarizing personnel with the spray block and activities at the airport.

On the morning of May 17 at 4:00 a.m. the wind was calm and the sky was clear. The decision was made at 4:30 a.m. to mix the first batch of chemical and wait for daylight. The pilots arrived at about 5:30 and it was found that ice was covering all aircraft and they could not fly until the temperature rose to a satisfactory level of 36°F. The chase plane, a Cessna Cardinal, scheduled to participate in the program was grounded due to water in the left wing tank. An appropriate aircraft had to be found as a substitute. A Cessna 150 was chosen and left the airport with Alan Miller at approximately 6:15 a.m. to observe the spray block. Upon arrival at the spray block, fog was found on the north boundary requiring start-up to be shifted to the south boundary. Also, school buses were noted moving through the area at 6:30 and Alan Miller made the decision to spray because of previous information that buses ran from 7:00 to 8:00 a.m. School buses did not stop running until 9:00 a.m.

The spray planes, two Ag-Cats and one Weatherly, were loaded at approximately 6:26 a.m. and proceeded to the spray block. One Ag-Cat and the Weatherly proceeded to fly in tandem while the second Ag-Cat observed. The Ag-Cat and Weatherly finished their runs and the third aircraft proceeded to make his runs.

It was soon noted that the Cessna 150 could not keep up with the spray plane and observation at 5,000 feet was impractical. Alan Miller requested another chase plane and returned to the airport to await another plane. Another plane was obtained (Cessna 175) and took off for the spray block. The radio in this aircraft ceased to operate and Miller requested another plane. This plane was brought back to the airport and Miller advised the contractor that an area had been missed in Blocks I and III. However, due to no radio contact, they would continue where they had ceased on the last run. The miss, or skip, would be picked up a later date. Word was given that the Cardinal (Cessna) would be

ready later in the day. Several runs were made without the use of radio contact with the pilots. Miller decided it was impossible to continue and other aircraft would have to be used.

Meanwhile on the ground the crews were having problems with the mixing equipment as follows: the pumps on Ag-Cat 2 malfunctioned at 8:00 a.m. and were repaired at 9:30. The engine on the mixing tank ceased to operate at 9:40 a.m. and was repaired and back working at 10:30. The engine on the mixing tank quit again at 11:15, but was back on again at 11:40. At 12:20 p.m. the engine on the mixing tank quit again and was repaired by Alan Miller. New points and a condensor were put into the engine. Restarted at 1:30 p.m., the engine continued to run until shutdown at 7:26 p.m. on May 17, 1983.

The Cardinal was operational and all observation flights in the afternoon were conducted with this aircraft.

During the entire day three pilots were used to fly the aircraft and they were: Cessna 150 - Dave DeAndrea; Cessna 175 - John Updike; Cessna (Cardinal) - John Updike and Ralph Shelton Davis.

On May 17 it was noted that more manpower was needed to move the chemical to the nurse tank. Each barrel weighed approximately 600 pounds and it was hard work to move them. The barrels were drafted with a pump and then manually triple rinsed and applied to final mix. One problem that existed was that there was no way the water could be measured that was put into the barrels for rinsing. After rinsing, the mix was monitored into the nurse tank through a meter. The meter should have been calibrated but this was an oversight that persisted throughout the entire operation.

The winds were calm (3-5 mph) and temperature in the mid 60's. Spraying continued all day and by the end of the day (May 17) 8,408 acres were treated.

Also on May 17 at 2:08 p.m. the Weatherly left the airport and had to return at 2:12 with its load. An engine problem had developed. Four new plugs were installed and the Weatherly was again in the air at 4:27 p.m.

On each day the radio stations were notified that we were treating and all police and sheriff departments were notified. Charles Coffman handled these details and answered all incoming calls.

All personnel returned to Motel 81 and supper was at a late hour (9:00-10:00 p.m.).

May 18, 1983

The airport crews left Motel 81 at 4:00 a.m. and arrived at the airport by 4:30. Upon arrival the first batch of chemical was mixed and ready for the planes to load by daylight.

The gasoline truck which supplied the aircraft would not run and was repaired by Alan Miller before 6:00 a.m.

The first loads were off the ground by 6:46 and the spraying continued. However, the nurse tank developed a leak at 7:15 a.m. and was repaired by 8:01. The planes were unable to take off because gasoline was needed and could not be obtained until 8:30. The planes did not get off the ground until 9:15 to resume spraying. Since there were enough people on the ground at the spray block, Alan Miller requested the block or ground supervisor to ride in the chase plane and assist. At 9:40 a.m. the engine on the nurse tank had quit again and would not restart. Alan Miller and J. D. Hacker returned to the airport and inspected the engine. The engine was dismantled by Miller and it was found that the exhaust valve was damaged. A new valve was requested and replaced or hand seated by Miller and Hacker. Their personal tools were used to fix the engine. The engine was repaired at 12:25 p.m., the Bt mixed and flights resumed at 1:31. Alan Miller made the decision to stay on the ground after the first flight in the evening and observe the ground operations. J. D. Hacker would observe from the chase plane until operation ceased. All ran smoothly until about 4:51 when only two aircraft returned to the airport after making the spray run. Ag-Cat 2 had developed engine problems short of the runway and he made a forced landing approximately 1½ miles from the end of Runway 17. The airplane was inoperable, however the pilot was not hurt.

Operations were shut down and resumed at 6:00 and continued to 8:26, when all returned to the airport.

The weather and wind (65°F., 3-7 mph winds) held all day May 18, and 7,420 acres of forest land were treated. A total of 15,828 acres were treated in two days.

May 19, 1983

The weather was starting to close-in and the pilots were notified to get off as soon as possible. Take-off was at 6:08 a.m. and two trips were made to treat 907 acres. Finished at 7:22 a.m. A total of 16,735 acres were treated May 17, 18, 19, 1983.

During the operation the USFS made a visit and the comments were that it was one of the smoothest operations they had seen. The USFS representatives were Noel Schneeberger and Dick Reardon.

The Sandoz Chemical Company representative, Temple Bowen, also commented that it was a very smooth operation.

The following persons worked at various tasks: A. E. Cole, Division Director, was on hand throughout the entire operation and was in overall supervisory capacity. A. E. Cole was on spray blocks, airport operations and chase plane at various times. Alan Miller, Supervisor and chase plane May 17 and one-half day on May 18. J. D. Hacker, Block Supervisor and in chase plane May 18 and May 19. Bob Williams, Bob Frame, recorded all mixing data and kept records of aircraft loads, departure and return times and assisted in mixing. Charles Coffman, maintained phone, met news media, etc., at airport and assisted with handling barrels and mixing insecticide to some extent. Philip Wygal, DNR, maintained radio contact at all times with ground and chase plane (Aircraft 2). Harold Smallwood, DNR, maintained radio contact on spray block and manned corner

with balloons. Jerry Atkins, DNR - maintained radio contact in spray block. Nathan Thompson, DNR - on spray block and assisted at airport handling barrels and running errands when needed. Clark Haynes, Bardwell Montgomery, Tom Mason, Gary Gibson - all WVDA employees, maintained corners of block, monitored spray and assisted at airport handling barrels of chemical.

It may be noteworthy to mention that the pilots of each aircraft were as follows: Charles (Chance) Davis - Ag-Cat N8923H - 47 nozzles (8004) 100 mph at 60 psi - 100' swath. Jack Ross - Ag-Cat N7095 - 47 nozzles (8004) 100 mph at 60 psi - 100' swath. John Roberts - Weatherly - N9270W - 50 nozzles (8004) 100 mph at 50 psi - 100' swath.

Also during the treatment program, numerous news media persons visited the airport. These included USA Today, photography crew from Sandoz Chemical Company, and local news media.

To summarize the entire project, it ran very smoothly even though we had numerous breakdowns at the airport operations. This smooth operation reflects on the caliber of personnel that are employed with the WVDA. Each was called upon to perform various tasks and they did so. The mixing operations at the airport could not be handled by the Shenandoah Agri-Air crew and it was necessary for our employees to not only assist but to actually perform the needed tasks to complete the project.

In future years, if Ag-Cats are used, the block will have to be broken into smaller areas and then they can perform well. Otherwise, larger aircraft are needed to perform the task.

Monitoring for the gypsy moth continues and the methods by which these are attained are:

Burlap Banding - Bands made of canvas, cotton, etc. are placed on host trees to detect the presence of gypsy moth caterpillars. In 1983 larvae were collected from Berkeley, Jefferson and Morgan Counties where populations are extremely high. In addition, larvae were collected in Hampshire, Mineral and Grant Counties. These counties are not as heavily infested as the three extreme eastern counties but are generally infested. The finding of larvae in Grant County was at Dam Site 14 on the Laurel Dale Road and represents the most western and southern infestation of the gypsy moth in West Virginia.

Gypsy Moth Pheromone Trapping Program - Approximately 3,000 traps were placed throughout West Virginia. Limited funds were available for hiring people to set and maintain traps on a grid pattern in the following counties: Barbour, Harrison, Lewis, Marion and Taylor (one trap per 3-square miles); Monongalia and Preston (one trap per 2 Kilometers); Tucker County - one trap per 9 square miles. The remainder of the state was trapped at random with no set grid or pattern. The only new county record was Putnam County where 2 male moths were recovered at the I-64 Rest Area on the south side. The remainder of the catches were in counties where moths were previously caught and they were: Pendleton (28); Tucker (21); Randolph (10); Preston (1056); Barbour (14); Upshur (1); Harrison (4); Marion (4); Monongalia (42); Wetzel (1); Tyler (4); Pleasants (1); Mercer (3); Marshall (14); Ohio (44); Brooke (63); and Hancock (35); The Eastern Panhandle counties of Grant, Hardy, Mineral, Hampshire,

Morgan, Berkeley and Jefferson are generally infested and no traps were placed. Included in the total number of catches for counties are Canaan Valley State Park (11); Pipestem State Park (2); and Tomlinson Run (3).

In West Virginia the first male moth was caught in 1972 and since that time 35 counties have had male moth catches.

Egg Mass Surveys - Egg mass surveys were conducted in early 1983 and 250-1700 egg masses/acre were found in Morgan and Berkeley Counties. The actual delimiting of these egg masses determined the treatment area for 1983. Egg mass surveys conducted in late 1983 (September-December) indicated extremely high numbers in Morgan (250-10,200 egg masses per acre), Berkeley (250-4,000 egg masses per acre); Jefferson County (Blue Ridge 250-10,000 egg masses per acre).

Areas in Hampshire and Mineral have egg masses that may number as many as 200 per acre. These areas are generally along the Potomac River basin extending westward at Bloomington Lake and extending eastward.

Preliminary surveys show that 51,000 acres of forest land in Eastern Panhandle need treatment. These areas are identified as Berkeley Springs (Morgan County) 19,000 acres; Hedgesville area (Berkeley County) 18,000 acres; and Blue Ridge (Jefferson County) 14,000 acres.

All gypsy moth egg masses examined had evidence of the parasitic wasp Ooencyrtus kuvanae. This parasite seems to stay with advancing populations of the gypsy moth and is responsible for helping to reduce populations.

OTHER INSECTS

The following is a short synopsis of other insects that occurred in West Virginia during 1983.

Scale Insects

New State Record - Xylococculus betulae. This scale insect was collected on American Beech in Pocahontas County on Gaudineer Knob, October 10, 1983, by S. Clark Haynes, Pathologist in the West Virginia Department of Agriculture. This scale insect attacks paper and yellow birch and beech. The adults are orange-red, about 4 mm long and are covered with white wax. Damage to beech consists of roughened or swollen spots of bark up to 2 inches in diameter. Then spots dry out as they age and additional cracks form around them. Damaged spots may be found over the entire trunk, but they usually occur in narrow longitudinal strips, starting at old branch stubs. The major scale insects submitted to the laboratory were: White peach scale, Pine needle scale, Euonymus scale, Tuliptree scale (numerous specimens), Juniper scale, Oystershell scale, Obscure scale, and Magnolia scale.

Borers

With the increased use of wood as a supplemental fuel and the building of log homes comes the increased reports of wood boring insects. The following

is a list of those submitted for identification: Rustic borer, Ribbed pine borer, Painted hickory borer, Carpenter bee (very common), Tan bark borer, Old house borer, and Carpenter ants.

The bronze birch borer, dogwood borer, rhododendron borer, and peach tree borers continue to be problems on their host plants.

Aphids

Aphids were not as plentiful this year, but are capable of causing damage to host plants when abundant. The white pine bark aphid Pineus strobi was found on most white pine trees throughout the state. This insect can cause white pine to become off-color (yellowish) and not suitable for Christmas trees. Other aphids submitted were Wooly alda aphid, and Woody larch aphid.

Gall Insects

Gall insects were common and included: Maple bladder gall, Maple spindle gall, Gouty vein gall, Succulent oak gall, Dogwood club gall, and Phylloxeran gall on hickory.

Throughout the year numerous insects of little consequence and others of major importance are submitted. The following is a short list of some of these.

The larger elm leaf beetle and elm leaf beetle, Monocesta coryli and Pyrrhalta lateola, found throughout the state on elm.

The pine webworm, Tetralopha robustella, common throughout the state.

The larch sawfly, Pristiphora erichsonii, found on larch in Pocahontas County.

Pales weevil, Hylogius pales, causing moderate damage to 2 acres of white pine Christmas tree plantation in Upshur County.

White pine weevil, Pissodes strobi, causing heavy damage to white pine Christmas tree plantation in Grant County.

The oak skeletonizer, Bucculatrix sp., common throughout the state on oaks in late August.

Dieback of white pine terminals was a common occurrence in 1983. The causal agent is thought to be the extreme high temperatures, drought and wind. How, you may ask, does this cause dead terminals? The white pine trees observed with this particular damage were on knolls, ridge tops, or other places where wind was prevalent. Evapotransporation, the process of plant giving off moisture, was accelerated by high temperatures. The drought conditions did not leave any excess water available for the plant to transpire. The winds actually increased the evapotransporation process and the top terminals actually died due to no available water. This malady was noted in Kanawha County and Eastern Panhandle counties. The trees in low lying areas were not affected to any great extent.

PATHOLOGY SECTION

HARDWOOD DISEASE PROBLEMS

Anthracnose disease incidence of hardwoods, Gnomonia sp., was moderate to heavy this year. White oak anthracnose, caused by the fungus Gnomonia quercina, was moderate to heavy, while sycamore anthracnose caused by the fungus Gnomonia platani, occurred at light to moderate levels. The cool, moist spring we encountered undoubtedly affected disease incidence.

Phyllosticta leaf spot, Phyllosticta minima, was observed on red maple in the state. Incidence was not nearly as severe as it had been in past years.

Tar spot, Rhytisma acerinum, was observed on red maple in the understory in Pocahontas County. Little or no permanent damage is expected.

Bullseye leaf spot, Cristulariella pyramidalis, incidence was light this year on maples, ash and other hardwoods. The hot, dry summer we experienced was apparently responsible for the decrease in disease incidence.

Apple scab, Venturia inequalis, incidence was extremely heavy this year on apples and crabapples. Virtually every crabapple suffered heavy defoliation. The cool, moist spring we experienced was apparently responsible for the increase in disease incidence.

Actinopelte leaf spot, Actinopelte dryina, incidence was extremely light. Only one foliage specimen displaying the symptoms of Actinopelte leaf spot was submitted to the laboratory this year.

Elm phloem necrosis, Elm Yellows MLO, was first reported in West Virginia during the 1930's. This disease had not been reported in West Virginia since the early 1940's, until this year. During routine survey work in the Charleston area several dying elms were spotted. Close examination of the elms revealed that the trees did not have DED but were dying from phloem necrosis caused by an MLO. All the classical phloem necrosis symptoms including the wintergreen odor and butterscotch colored cambium were present.

Beech bark disease complex, Nectria galligena and Cryptococcus fagisuga, were found at the Gaudineer Scenic Area in the Monongahela National Forest in 1981. The classical beech bark disease pathogen, Nectria coccinea var. faginata, was found fruiting on a few dead and dying trees near the scenic area during the summer of 1983. The state forest pathologist assisted the USFS-S&PF with the establishment of research plots and a disease impact survey. Disease incidence was much worse than initially thought. Approximately 8,000 acres of dead and dying beech are now known to occur on the Monongahela National Forest.

Oak mortality, a stress related disease, has been observed in several sections of the state. Due to insect defoliation and drought conditions encountered during the summer of 1983, it is anticipated that oak mortality will increase. Investigations regarding oak mortality were conducted in Monroe County. The root rot pathogen, Armillariella mellea, and the two-lined chestnut borer, Agrilus bilineatus, had combined to cause extensive mortality in a stand of scarlet and black oak timber.

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The bronze birch borer, dogwood borer, rhododendron borer, and peach tree borers continue to be problems on their host plants.

Aphids

Aphids were not as plentiful this year, but are capable of causing damage to host plants when abundant. The white pine bark aphid Pineus strobi was found on most white pine trees throughout the state. This insect can cause white pine to become off-color (yellowish) and not suitable for Christmas trees. Other aphids submitted were Wooly alda aphid, and Woody larch aphid.

Gall Insects

Gall insects were common and included: Maple bladder gall, Maple spindle gall, Gouty vein gall, Succulent oak gall, Dogwood club gall, and Phylloxeran gall on hickory.

Throughout the year numerous insects of little consequence and others of major importance are submitted. The following is a short list of some of these.

The larger elm leaf beetle and elm leaf beetle, Monocesta coryli and Pyrrhalta lateola, found throughout the state on elm.

The pine webworm, Tetralopha robustella, common throughout the state.

The larch sawfly, Pristiphora erichsonii, found on larch in Pocahontas County.

Pales weevil, Hylogius pales, causing moderate damage to 2 acres of white pine Christmas tree plantation in Upshur County.

White pine weevil, Pissodes strobi, causing heavy damage to white pine Christmas tree plantation in Grant County.

The oak skeletonizer, Bucculatrix sp., common throughout the state on oaks in late August.

Dieback of white pine terminals was a common occurrence in 1983. The causal agent is thought to be the extreme high temperatures, drought and wind. How, you may ask, does this cause dead terminals? The white pine trees observed with this particular damage were on knolls, ridge tops, or other places where wind was prevalent. Evapotransporation, the process of plant giving off moisture, was accelerated by high temperatures. The drought conditions did not leave any excess water available for the plant to transpire. The winds actually increased the evapotransporation process and the top terminals actually died due to no available water. This malady was noted in Kanawha County and Eastern Panhandle counties. The trees in low lying areas were not affected to any great extent.

PATHOLOGY SECTION

HARDWOOD DISEASE PROBLEMS

Anthracnose disease incidence of hardwoods, Gnomonia sp., was moderate to heavy this year. White oak anthracnose, caused by the fungus Gnomonia quercina, was moderate to heavy, while sycamore anthracnose caused by the fungus Gnomonia platani, occurred at light to moderate levels. The cool, moist spring we encountered undoubtedly affected disease incidence.

Phyllosticta leaf spot, Phyllosticta minima, was observed on red maple in the state. Incidence was not nearly as severe as it had been in past years.

Tar spot, Rhytisma acerinum, was observed on red maple in the understory in Pocahontas County. Little or no permanent damage is expected.

Bullseye leaf spot, Cristulariella pyramidalis, incidence was light this year on maples, ash and other hardwoods. The hot, dry summer we experienced was apparently responsible for the decrease in disease incidence.

Apple scab, Venturia inequalis, incidence was extremely heavy this year on apples and crabapples. Virtually every crabapple suffered heavy defoliation. The cool, moist spring we experienced was apparently responsible for the increase in disease incidence.

Actinopelte leaf spot, Actinopelte dryina, incidence was extremely light. Only one foliage specimen displaying the symptoms of Actinopelte leaf spot was submitted to the laboratory this year.

Elm phloem necrosis, Elm Yellows MLO, was first reported in West Virginia during the 1930's. This disease had not been reported in West Virginia since the early 1940's, until this year. During routine survey work in the Charleston area several dying elms were spotted. Close examination of the elms revealed that the trees did not have DED, but were dying from phloem necrosis caused by an MLO. All the classical phloem necrosis symptoms including the wintergreen odor and butterscotch colored cambium were present.

Beech bark disease complex, Nectria galligena and Cryptococcus fagisuga, were found at the Gaudineer Scenic Area in the Monongahela National Forest in 1981. The classical beech bark disease pathogen, Nectria coccinea var. faginata, was found fruiting on a few dead and dying trees near the scenic area during the summer of 1983. The state forest pathologist assisted the USFS-S&PF with the establishment of research plots and a disease impact survey. Disease incidence was much worse than initially thought. Approximately 8,000 acres of dead and dying beech are now known to occur on the Monongahela National Forest.

Oak mortality, a stress related disease, has been observed in several sections of the state. Due to insect defoliation and drought conditions encountered during the summer of 1983, it is anticipated that oak mortality will increase. Investigations regarding oak mortality were conducted in Monroe County. The root rot pathogen, Armillariella mellea, and the two-lined chestnut borer, Agrilus bilineatus, had combined to cause extensive mortality in a stand of scarlet and black oak timber.

Ash branch mortality was observed on white ash trees in Cabell and Kanawha Counties. Affected trees appeared as though they had been attacked by the periodical cicada. Reports of trees displaying similar symptoms have been received from Monongalia County. The dead and dying branches were heavily cankered. The fungus Fusicoccum sp. was readily isolated from the cankered areas. Drought conditions may have predisposed the trees to attack by the fungus. To date we have found no evidence of ash decline associated with the ash decline MLO.

Maple decline, a stress related disease syndrome, has been noted in urban areas as well as in forests and sugar bush orchards. The fungus Steganosporium sp. was observed inciting branch mortality on sugar maples in Pocahontas County. Steganosporium sp. is a secondary pathogen frequently associated with declining maples in the forest. Apparently drought was the primary stress inducing factor.

Nectria canker, Nectria galligena, is a common disease problem throughout West Virginia on a variety of hardwood trees. This disease is particularly severe on birch, sassafras and other trees that occur or are planted on poor sites.

Slime flux, Erwinia nimipressuralis, is a common problem of elm trees. However, other tree species such as oak and maple have been observed with slime flux infections.

Bacterial Canker of oak occurs through wounds. The bacterial infection occurs in the inner bark and cambium. It is easily identified from the foam-like white flux that has an alcoholic or sour odor. Large areas of cambium can be killed from infection by the unidentified bacterium. Bacterial canker is confined to the cambial region and inner bark, whereas the slime flux develops as an infection of the older sapwood and heartwood.

CONIFER DISEASE PROBLEMS

Armillariella root rot, Armillariella mellea, is often a serious malady in conifer plantations. During 1983 a number of investigations were conducted regarding conifer mortality. In several instances, A. mellea was associated with the mortality problem.

Cylindrocladium root rot, Cylindrocladium sp., is a perennial problem at the Parsons Forest Seedling Nursery. Fortunately during 1983 losses to this disease were almost nonexistant. The decrease in disease incidence could, in part, be attributed to the fact that the plants received adequate but not excess moisture during the growing season.

Phytophthora root rot, Phytophthora cinnamomi, is known to cause mortality in at least five Fraser and Douglas fir Christmas tree plantations. Efforts will continue to survey for the problem.

White pine root decline, Verticicladiella procera, continues to be a serious problem in many white pine plantations. The disease has been found in plantations as well as in some native stands.

Red ring rot, Phellinus pini (Fomes pini), has been observed causing extensive decay in red spruce in Pocahontas and Randolph Counties. Large overmature trees appear to be particularly susceptible to this pathogen.

Cytospora canker, Cytospora kunzei, causes branch mortality on Colorado blue spruce and Norway spruce throughout the state. Typically on one or two isolated trees at any one location become infected. Mainstem cankers have been noted on some Norway spruce.

Atropellis canker, Atropellis tingens, occurs on Scotch and Austrian pines planted on poor sites. During 1983 the disease was found for the first time on Scotch pine in Pocahontas County. Typically the cankers and fruiting structures are only observed on the smaller branches.

Hemlock canker continues to be a problem in some hemlock plantings in West Virginia. This problem usually only occurs when hemlocks are planted in poorly drained heavy clay soils. Affected trees appear off-color and exhibit resinosus near the ground line where the cankers occur.

Diplodia tip blight, Diplodia pini, has been noted throughout the state causing branch tip mortality of Austrian, Scotch, red, pitch and table mountain pines. Austrian pines appear to be the most susceptible to this disease.

Lophodermium needlecast, Lophodermium pinastri, has not been a serious problem in West Virginia for a number of years. Only an occasional heavily infected tree is found. In recent years disease resistant varieties of Scotch pine have been employed. In addition, the dry late summer and fall weather conditions we have encountered in recent years hasn't been conducive to infection.

Naemacyclus needlecast, Naemacyclus minor, is a common disease in West Virginia Scotch pine Christmas tree plantings. Although this disease is common it caused little damage in 1983.

Swiss needlecast, Phaeocryptopus gaumanni, occurs on Douglas fir in several Christmas tree plantations. Symptomatic trees appear chlorotic and are usually rendered unsalable. To date the disease has been reported in Hampshire, Mingo, Raleigh, Mercer, Greenbrier, and Barbour Counties.

Rhizosphaera needlecast, Rhizosphaera kalkhoffi, has been observed in Colorado blue spruce plantings in Morgan, Marion, Kanawha, Raleigh and Randolph Counties. The specimen from Randolph County was a new county record. Typically, diseased trees suffered little damage.

Biffusella needlecast, Biffusela linearis, was reported for the first time in West Virginia on a single white pine tree in Monroe County. The fungus produces a black fruiting structure that runs nearly the entire length of the needle. Only 2nd and 3rd year needles were affected.

Hypoderma needlecast, Hypoderma lethale, was observed causing needlecast on pitch pine in Pocahontas County. The infected needles appear green and healthy near the base with the remainder of the needles appearing bleached out and dead. Small black fruiting bodies develop on the bleached out portion of the diseased needles.

Pinewood nematode, Bursaphlenchus xylophilus, is known to occur in 13 of West Virginia's 55 counties. In West Virginia the pinewood nematode has been isolated from Austrian, Scotch, white and red pine. Since the pinewood nematode is now considered native in the United States, surveys for this pathogen will be discontinued.

ABIOTIC FACTORS

Scorch

Sun scorch symptoms were extremely severe in July and August when we experienced hot, dry weather conditions. Some trees suffered extensive damage. Newly planted dogwoods and maples appeared hardest hit, but damage also occurred to other tree species.

Air Pollution

Air pollution damage appeared to be light this year. Oxidant pollution damage was evident on scattered white pine trees in the eastern and southern sections of the state.

Salt

Deicing salt damage to ornamentals didn't appear as severe during 1983 as it had in past years. The weather during the winter of 1982 and 1983 was extremely mild, therefore only small quantities of deicing salts were used.

Herbicide Damage

The improper application of herbicides and vandalism involving herbicides continued to be a problem during 1983. A number of incidents involving misapplication and vandalism were investigated.

Fall Needle Drop

During the fall of 1983 we received numerous complaints regarding the apparent death of pine trees. Further investigations revealed that only the inner or third year needles were turning yellow and dropping. Most conifers only retain needles two or three years. After this period of time, the old needles have served their purpose and are shed. The process may be more sudden and dramatic in some years than others.

PROJECTS

White Pine Blister Rust

Surveys were performed on 26,630 acres.

Sixty acres of the control area was set aside as needing "No Further Work".

Suppression work was completed on 1,760 acres, with 3,963 Ribes destroyed.

State of Control

(State and Private)

White Pine	Control Area	On Maintenance	No Further Work
228,518 A	416,766 A	416,776 A	405,443 A
	(Federal Land)		
86,920 A	144,503 A	144,503 A	144,503 A
315,438 A	561,279 A	561,279 A	549,946 A

Oak Wilt Detection - Ceratocystis fagacearum

Sixteen (16) high oak wilt disease incidence quadrangles in the Eastern Panhandle and 20 high incidence quadrangles in the southwestern section of the state were flown during the summer. Symptomatic trees were marked on USGS quadrangle maps. Disease incidence remained the same as last year. The following low incidence counties were flown: Randolph, Barbour, Upshur, Nicholas, Pocahontas, Monongalia, Preston, Marion, Taylor, and Harrison. Suspect trees were spotted in Harrison and Barbour Counties. Ground crews investigated and took samples. Positive cultures were obtained from the Harrison County spot. Since at least one active oak wilt center occurs in Harrison County, no further effort will be made to clear that county for the exportation of oak veneer logs to Europe.

Oak wilt has never been found in Brooke, Ohio, Webster and Tucker Counties. Aerial surveillance is maintained over these counties to ensure that they remain free of oak wilt. No spots were detected in these counties this year.

Chestnut Blight (Endothia parasitica)

Efforts have been made to develop blight resistant trees from surviving American chestnut trees displaying blight resistance through a selective breeding program. Various grafting techniques have been employed on the project.

Other areas of work include assisting researchers from WVU and other institutions with the maintenance and evaluation of hypovirulence spread plots. These studies are long term in nature. Hopefully, when completed, we will be able to more fully understand the nature of hypovirulence and its potential uses as a chestnut blight control agent.

BIOLOGICAL CONTROL PROGRAM ACTIVITIES

Prepared by: Thomas L. Mason, Jr. Entomologist

INTRODUCTION

The West Virginia Department of Agriculture Biological Control Program headquarters were moved to Inwood in 1981 to more effectively address the problem of the gypsy moth (GM), Lymantria dispar L., that is now established in eastern West Virginia. The lack of sufficient manpower needed to complete the various GM related tasks in this area of the state forced this program to become involved in many more aspects of the GM problem than just biological control. They include the following:

* training field personnel
* coordinating and participating in egg mass surveys
* evaluating survey results
* delimiting spray blocks
* participating in the spray program
* evaluating spray program results

Despite the addition of these new duties, this program has waged an aggressive campaign against the GM over the last two years. This report summarizes those activities.

Release of Glyptapanteles flavicoxis (Marsh)

The most ambitious project ever undertaken by this program was the large scale release of G. flavicoxis made in 1983. This parasite, a native of India, is a small wasp that attacks the larval stage of the GM. The important role that G. flavicoxis may play in future GM management programs lies in its reproductive potential. Each gravid female is capable of depositing up to 500 eggs during the attack of dozens of caterpillars. Its ability to complete two generations per year allows for an even greater impact on host populations. The fecundity displayed by G. flavixocis is more than that for all of the parasites imported to this country for GM suppression combined. When one considers that egg masses in building pest populations contain an average of 500 eggs, it would seem that a parasite has been found that can keep pace with the GM. Part of this project was designed to test this premise.

In 1983, a total of 484,000 G. flavicoxis were released against GM populations at 26 locations in the Eastern Panhandle of West Virginia. Approximately 292,000 of this number were released into sixteen (16) 50-acre study blocks to evaluate the action of this parasite on host populations. Most of the remaining parasites were released to appease local residents that complained about the nuisance of gypsy moth caterpillars on their property. Another quantity was retained for study in the laboratory.

Results from the study portion of the release program have not been completely evaluated, but those statistics that have been prepared indicate that G. flavicoxis exerted considerable influence on target GM populations. The most striking statistic was the incidence of successful attack detected in the study blocks. For instance, parasitized caterpillars were recovered at an average of 88% of the release points in those blocks that received both G. flavicoxis at the high release rate (1000/acre) and an application of Bt. The attacked caterpillars in those blocks had an average of 22.1 cocoons attached to them. Similar recoveries of this parasite were made in the rest of the study blocks as well as at other sites where random releases were made.

The ultimate goal of any parasite release program is establishment because the need for costly annual introductions is eliminated. The successful overwintering and establishment of G. flavicoxis cannot be determined until summer 1984, however, two encouraging signs are present which indicate that establishment of this species is a very real possibility. The first is the degree of successful attack witnessed in 1983 which suggests that the climate requirements for G. flavicoxis have been met. Recoveries of this parasite have been very infrequent in more northerly states such as Pennsylvania and New Jersey where the climate is more severe. The second reason for optimism has to do with alternate hosts. The Eastern Panhandle as well as other areas of the state harbors several lymantriids in the genus Dasychira that overwinter as nearly mature caterpillars. If G. flavicoxis adults emerging in late summer could successfully attack one of these native lymantriid species, it is likely that those caterpillars could carry this parasite through the winter. The lack of suitable alternate hosts that has prevented the establishment of many parasites imported to the United States for GM suppression may be overcome in West Virginia.

Gypchek (NPV) Screening Trials

This study, made in cooperation with the United States Forest Service (USFS), was designed to test the feasibility of using Gypchek to dampen GM populations in isolated woodlots of the Eastern Panhandle prior to egg hatch. The active ingredient in Gypchek is the same nucleopolyhedrosis virus (NPV) responsible for the collapse of dense GM populations in the northeastern U.S. By applying this control agent to GM populations at pre-outbreak levels, it was hoped that a viral epizootic would be created causing a population collapse long before any significant defoliation can be produced.

Applications of Gypchek by backpack mist blower took place on April 26, 1983, and was completed the next day. The seven man crew treated each acre with 5 gallons of the tank mix. The number of polyhedral inclusion bodies (PIB's) applied per acre was approximately 1×10^{12}.

This project was evaluated by comparing the number of virus killed caterpillars under tree bands in the treated areas to those in the control areas, estimating defoliation, and determining any egg mass reductions that occurred as a result of the treatment.

The data gathered indicated that Gypchek had very little effect on host populations in any of the treated areas. Probably the factor most responsible for these negative results was the ineffectiveness of the sunscreen used in the

formulation of Gypchek . The purpose of a sunscreen is to protect the virus from ultraviolet light which can destroy NPV 24 to 48 hours after application. Other factors that could have contributed to the lack of success experienced with Gypchek include the strain of the virus, the unusually wet spring, the spreader stickers employed, the application technique, or the stress compound used. Regardless, the information obtained from this effort will help to refine and further develop Gypchek into an efficacious product. Considering the tremendous potential of this control material and the great application it would have in West Virginia, the continued involvement of the WVDA in future Gypchek screening trials is recommended.

Invertebrate predation of GM egg masses by Cryptorhopalum ruficorne LeConte (Order Coleoptera: Family Dermestidae)

This study began on October 31, 1981, with the discovery of Cryptorhopalum larvae among egg masses in the Florence Jones Reineman Wildlife Sanctuary near Carlisle, Pennsylvania. At that time egg masses were being collected as part of an interagency effort to rear the egg parasite Ooencyrtus kuvanae (Howard) for release in West Virginia. Those collections represented the first association of C. ruficorne with GM egg masses.

Activities in this study during FY 82-83 were aimed at determining the relative abundance of C. ruficorne. To accomplish this, samples of recently laid GM egg masses were made at the Sanctuary, and each one was individually examined for the presence of Cryptorhopalum. The greatest incidence of C. ruficorne in any one sample was 14.4%. Four different samples of egg masses taken from one area in the Sanctuary averaged 10.3%. The greatest number of C. ruficorne larvae found to attack GM egg masses on a single tree was five, and it was common to find two larvae on one mass. Collections of C. ruficorne at several locations in West Virginia show that the populations encountered at the Sanctuary do not represent chance occurrences. Details of these studies and observations have been prepared for publication in The Canadian Entomologist.